NASA/SP—1999–7501/SUPPL2

NASA THESAURUS SUPPLEMENT

A three-part cumulative update of the
1998 edition of the *NASA Thesaurus*

January 1999

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  7121 Standard Drive
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NASA THESAURUS SUPPLEMENT

A three-part cumulative update of the
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**National Aeronautics and
Space Administration**

January 1999

Available from:

NASA Center for AeroSpace Information
7121 Standard Drive
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Table of Contents

Introduction

This Supplement is a cumulative update to the 1998 edition of the *NASA Thesaurus* (NASA/SP—1998–7501). The update includes all new terms and associated hierarchies added between the cut-off for the 1998 edition (December 1997) through January 1, 1999. Parts 1 and 2 of this *Supplement* correspond to Volumes 1 and 2 of the printed edition of the *NASA Thesaurus*. Supplements are normally published every six months.

Part 1 (*Hierarchical Listing*) contains the full hierarchical structure for each new term along with all new cross references. Term definitions, previously presented as Part 3 of past supplements, have been integrated into the Part 1 listing.

Display elements comprising the hierarchical listing are as follows:

Display Element	**Notation**
Generic Structure	GS
Related Term	RT
Use	USE
Use For	UF
Scope Note	SN
Definition	DEF
Array Terms	∞

For a fuller explanation, see the Introduction (pages viii–xi) in the printed version of the 1998 *NASA Thesaurus*, Volume 1.

Part 2 (*Rotated Term Display*) is a ready reference tool which provides additional 'access points' to the thesaurus terminology. It contains the postable terms and nonpostable cross references found in the Hierarchical Listing (Part 1) arranged in a KWIC (key-word-in-context) index.

Part 3 (*Changes*) is a listing of deletions or changes to postable terms or USE references made since the 1998 edition of the *NASA Thesaurus*. To control the size of the Supplement, only significant changes in term hierarchies and related term lists are presented.

NOTE: Other resources and products related to the NASA Thesaurus can be found at the following URL: **http://www.sti.nasa.gov/thesfrm1.htm**.

In addition to the above mentioned resources, a thesaurus listserv has been set up for submitting candidate terms and discussion of related lexicographical issues. A listing of candidate and accepted new terms is posted monthly. To subscribe to this listserv, send an e–mail message to **listserv@sti.nasa.gov**. Leave the subject line blank and in the message section, type **SUBSCRIBE THESAURUS–L <Your name>**. (Should you wish to cancel your subscription, send a message to the same address with UNSUBSCRIBE in the message section.)

Comments and suggestions regarding the NASA Thesaurus should be directed to:

Lexicographer
NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076–1320

E–mail: help@sti.nasa.gov
Fax: (301) 621–0134
Telephone: (301) 621–0114

NASA THESAURUS SUPPLEMENT

PART 1
HIERARCHICAL LISTING

A

Alpha Magnetic Spectrometer
(added June 1998)
UF *AMS (spectrometer)*
GS measuring instruments
. spectrometers
. . **Alpha Magnetic Spectrometer**
RT antimatter
Cerenkov counters
cosmic rays
dark matter
International Space Station
interstellar matter
magnetic spectroscopy
space station payloads
spaceborne astronomy

AMS (spectrometer)
USE **Alpha Magnetic Spectrometer**

antenna gain
(added June 1998)
GS amplification
. **antenna gain**
RT antennas
automatic gain control
directional antennas
effectiveness
high gain
signal reception

antiphase boundaries
(added March 1998)
UF *antiphase domains*
APB (materials)
GS boundaries
. **antiphase boundaries**
RT binary alloys
crystal dislocations
crystal lattices
crystal structure
grain boundaries
interfacial energy
intermetallics
microstructure
order–disorder transformations
solid solutions
solid–solid interfaces
superlattices
ternary alloys

antiphase domains
USE **antiphase boundaries**

APB (materials)
USE **antiphase boundaries**

B

Biot–Savart law
(added August 1998)
DEF Law describing the intensity of a magnetic field produced by a current carrying wire. Also applied in fluid dynamics to describe the flow–velocity field induced by a vortex.
GS laws
. **Biot–Savart law**
RT electromagnetism
flow velocity
magnetic fields
Maxwell equation
vortices

Boeing 717 aircraft
(added October 1998)
GS Boeing aircraft
. **Boeing 717 aircraft**
commercial aircraft
. **Boeing 717 aircraft**
jet aircraft
. turbofan aircraft
. . **Boeing 717 aircraft**
monoplanes
. **Boeing 717 aircraft**
passenger aircraft
. **Boeing 717 aircraft**
transport aircraft
. **Boeing 717 aircraft**
RT ∞ aircraft

bohrium
(added May 1998)
GS chemical elements
. **bohrium**
RT hassium
seaborgium

C

cascode devices
(added August 1998)
DEF Amplifier devices consisting of a common grounded–emitter (cathode) or source stage that drives a grounded–base output stage, resulting in high–impedance, high–gain, and low–noise,
GS amplifiers
. **cascode devices**
electronic equipment
. solid state devices
. . semiconductor devices
. . . **cascode devices**
RT CMOS
field effect transistors
high electron mobility transistors
switching circuits
transistor amplifiers
transistor circuits
transistors

clamped structures
(added February 1998)
RT beams (supports)
clamps
composite structures
joints (junctions)
laminates
plates (structural members)
shells (structural forms)
structural members
structural vibration
∞ structures

corrugated waveguides
(added February 1998)
GS waveguides
. **corrugated waveguides**
RT gratings (spectra)
optical waveguides
waveguide antennas

cycloaddition
(added June 1998)
DEF Pericyclic chemical reaction in which unsaturated molecules combine to form a cyclic compound under the influence of heat or light.
GS chemical reactions
. **cycloaddition**
. . Diels–Alder reactions
RT cyclic compounds
photochemical reactions
polymerization
synthesis (chemistry)

D

Darkstar unmanned aerial vehicle
USE **pilotless aircraft**
reconnaissance aircraft

Deep Space 1 Mission
(added October 1998)
DEF First of several technology demonstration missions supporting the NASA New Millennium Program. Advanced technologies include an ion propulsion system, solar concentrator arrays, autonomous navigation and control systems, an integrated camera and imaging spectrometer, and several telecommunications and microelectronics devices. The mission plan includes a flyby of Asteroid 1992 KD.
UF *DS1 (space mission)*
GS space missions
. **Deep Space 1 Mission**
RT asteroid missions
autonomous navigation
flyby missions
interplanetary spacecraft
ion propulsion
NASA space programs
solar electric propulsion

deformable mirrors
(added May 1998)
GS mirrors
. **deformable mirrors**
RT adaptive optics
light modulation
phase modulation
segmented mirrors

Delta 3 launch vehicle
(added October 1998)
GS launch vehicles
. Delta launch vehicle
. . **Delta 3 launch vehicle**

Delta 4 launch vehicle
(added October 1998)
GS launch vehicles
. Delta launch vehicle
. . **Delta 4 launch vehicle**

dielectric waveguides
(added February 1998)
GS waveguides
. **dielectric waveguides**
RT dielectrics
microwave transmission
optical waveguides
waveguide antennas
waveguide filters

differential games
(added October 1998)
GS games
. **differential games**
RT minimax technique
optimal control
pursuit–evasion games
stochastic processes
zero sum games

digital cameras
(added July 1998)
GS optical equipment
. cameras
. . **digital cameras**
photographic equipment
. cameras
. . **digital cameras**
RT CCD cameras
digital systems
digital techniques
photogrammetry
television cameras
video equipment

DS1 (space mission)
USE **Deep Space 1 Mission**

dubnium
(added May 1998)
GS chemical elements
. **dubnium**
RT rutherfordium
seaborgium

E

EAM (physical chemistry)
USE **embedded atom method**

embedded atom method
(added February 1998)
DEF A semiempirical calculation method developed by Daw and Baskes for determining the energetics of atoms in a bulk environment. The original form of the method was based on density functional theory and was intended primarily for tight–packed transition metals. More recent modifications have extended the applicability of the method to a large number of elements in the periodic table.
UF *EAM (physical chemistry)*
MEAM (physical chemistry)
modified embedded atom method
RT alloys
crystal defects
grain boundaries
interatomic forces
metals
∞ methodology
molecular dynamics
potential energy

enantiomeric compounds
USE **enantiomers**

enantiomers
(added August 1998)
DEF Isomeric pairs whose crystalline forms or molecular structures are non–superimposable mirror images.
UF *enantiomeric compounds*
enantiomorphs
GS isomers
. **enantiomers**
RT chirality
crystal structure
isomorphism
molecular structure
stereochemistry
symmetry

enantiomorphs
USE **enantiomers**

Euler–Bernoulli beam theory
USE **Euler–Bernoulli beams**

Euler–Bernoulli beams
(added April 1998)
UF *Euler–Bernoulli beam theory*
GS structural members
. beams (supports)
. . **Euler–Bernoulli beams**
RT axial strain
bending
bending vibration
dynamic structural analysis
elastic properties
mathematical models
partial differential equations
structural analysis
Timoshenko beams

evanescent waves
(added March 1998)
GS surface waves
. **evanescent waves**
RT acoustic impedance
evanescence
fiber optics
internal waves
plane waves
propagation modes
reflected waves
wave propagation
∞ waves

F

ferroelastic materials
(added June 1998)
GS **ferroelastic materials**
. shape memory alloys
. . nitinol alloys
RT ceramics
ferroelasticity
ferroelectric materials
∞ materials
smart materials

ferroelasticity
(added June 1998)
GS mechanical properties
. elastic properties
. . **ferroelasticity**
RT crystal structure
domain wall
ferroelastic materials
ferroelectricity
phase transformations
shape memory alloys
smart materials

field tests
(added November 1998)
SN (EXCLUDES TESTS OF ELECTRIC, MAGNETIC, OR ELECTROMAGNETIC FIELDS)
DEF Tests carried out in the actual setting in which the subject device is intended to operate.
RT environmental tests
performance tests
∞ tests

free–space optical communication
(added June 1998)
GS telecommunication
. communication
. . optical communication
. . . **free–space optical communication**
RT high power lasers
laser beams
satellite communication
space communication

free–space optical interconnects
(added June 1998)
UF *FSOI (integrated optics)*
GS optical interconnects
. **free–space optical interconnects**
RT integrated optics
interprocessor communication
optical computers
optical switching
optoelectronic devices
photonics

FSOI (integrated optics)
USE **free–space optical interconnects**

fullerides
(added February 1998)
GS carbon compounds
. **fullerides**
RT ∞ alkali metal compounds
∞ chemical compounds
doped crystals
fullerenes
superconductors (materials)

fuselage–wing stores
USE **wing–fuselage stores**

G

Gabor filters
(added February 1998)
GS image filters
. **Gabor filters**
RT computer vision
∞ filters
Gabor transformation
image analysis
image processing
low pass filters
neural nets
spatial filtering
textures

Gabor transformation
(added February 1998)
GS transformations (mathematics)
. **Gabor transformation**
RT Fourier transformation
Gabor filters
holography
image processing
signal analysis
wavelet analysis

games
(added October 1998)
GS **games**
. differential games
. pursuit–evasion games
. war games
. zero sum games
RT control theory
game theory
optimization

Godunov method
(added February 1998)
DEF Non–oscillatory finite–volume scheme that incorporates the exact or approximate solution to the Riemann initial–value problem, or a generalization of it.
GS analysis (mathematics)
. numerical analysis
. . finite volume method
. . . **Godunov method**
procedures
. finite volume method
. . **Godunov method**
RT approximation
Cauchy problem
Cauchy–Riemann equations
computational fluid dynamics
Euler equations of motion
finite difference theory
shock wave interaction
supersonic flow

H

H–2 control
(added February 1998)
GS automatic control
. optimal control
. . **H–2 control**
optimization
. optimal control
. . **H–2 control**
RT control systems design
control theory
controllers
feedback control
H–infinity control
linear quadratic Gaussian control

Hale–Bopp comet
(added July 1998)
DEF Long–period comet discovered July 23, 1995; designated C/1995 O1.
GS celestial bodies
. comets
. . **Hale–Bopp comet**
RT Oort cloud

hassium
(added May 1998)
GS chemical elements
. **hassium**
RT bohrium
meitnerium

head up tilt
(added March 1998)
DEF Body posture while lying on a tilt table with the head higher than the rest of the body.
UF *HUT (physiology)*
GS posture
. **head up tilt**
RT aerospace medicine
bed rest
bioastronautics
cardiovascular system
gravitational physiology
head down tilt
hemodynamic responses
lower body negative pressure
orthostatic tolerance
physiological responses
supine position
weightlessness simulation

HUT (physiology)
USE **head up tilt**

hybrid–Trefftz finite element method
USE **finite element method**
Trefftz method

hypothetical planets
(added June 1998)
UF *Phaethon (hypothetical planet)*
planet X
transplutonic planets
GS celestial bodies
. planets
. . **hypothetical planets**
RT comets
extrasolar planets
planetary orbits

I

inflight simulation
USE **in–flight simulation**

in–flight simulation
(added October 1998)
DEF The use of a specialized test aircraft to simulate the flight characteristics of another vehicle. The test aircraft is typically capable of duplicating the computed responses of the simulated vehicle through special aerodynamic and control system features.
UF *inflight simulation*
GS simulation
. flight simulation
. . **in–flight simulation**
RT aircraft control
flight characteristics
flight control
flight simulators
flight tests
training simulators

intelligent materials
USE **smart materials**

ion optics
(added June 1998)
RT beam waveguides
beamforming
electron optics
ion beams
ion engines
ion propulsion
mass spectrometers
∞ optics

Iridium network
(added December 1998)
DEF A 66–satellite wireless personal telecommunications network designed to provide worldwide telephone, paging, facsimile and data services to handheld or mobile equipment.
UF *Iridium satellites*
GS networks
. communication networks
. . **Iridium network**
. satellite networks
. . satellite constellations
. . . **Iridium network**
RT communication satellites
facsimile communication
mobile communication systems
satellite communication
telephony
wireless communication

Iridium satellites
USE **communication satellites**
Iridium network

J

Java (programming language)
(added December 1998)
GS languages
. programming languages
. . high level languages
. . . **Java (programming language)**
RT C++ (programming language)
client server systems
internets
object–oriented programming
World Wide Web

K

kink bands
(added March 1998)
RT buckling
compression loads
edge dislocations
failure modes
fiber composites
microstructure
plastic deformation
reinforcing fibers
single crystals

kinking
(added April 1998)
RT bending
buckling
compression loads
cracking (fracturing)
deformation
displacement
failure modes
fiber composites
folding
heaving
twisting
wrinkling

L

Laves phases
(added August 1998)
GS solid phases
. **Laves phases**
RT alloys
crystal lattices
crystal structure
cubic lattices
interstitials
microstructure
phase transformations

Lunar Prospector
(added February 1998)
GS artificial satellites
. lunar satellites
. . **Lunar Prospector**
lunar spacecraft

. lunar satellites
. . **Lunar Prospector**
RT lunar composition
lunar exploration
lunar programs
lunar resources
lunar surface

M

Martian meteorites
USE **SNC meteorites**

MEAM (physical chemistry)
USE **embedded atom method**

meitnerium
(added May 1998)
GS chemical elements
. **meitnerium**
RT hassium

MEMS (electromechanical devices)
USE **microelectromechanical systems**

microelectromechanical systems
(added October 1998)
UF *MEMS (electromechanical devices)*
GS electromechanical devices
. **microelectromechanical systems**
RT microinstrumentation
microminiaturization
microminiaturized electronic devices
microsatellites
nanosatellites

microsatellites
(added October 1998)
DEF Satellites with a total mass between 10 and 100 kg often incorporating miniaturized electronic and mechanical systems.
UF *microsats*
GS artificial satellites
. **microsatellites**
RT microelectromechanical systems
microminiaturization
microminiaturized electronic devices
nanosatellites
satellite constellations
satellite design
small satellite technology
small scientific satellites

microsats
USE **microsatellites**

Mindlin plate theory
USE **Mindlin plates**

Mindlin plates
(added April 1998)
UF *Mindlin plate theory*
Reissner–Mindlin plates
GS structural members
. plates (structural members)
. . **Mindlin plates**
RT dynamic structural analysis
finite element method
free vibration
plate theory
Reissner theory
shear strain
structural analysis
structural vibration
thick plates

mischmetal
(added June 1998)
DEF An alloy consisting of a natural mixture of rare–earth metals; used in electrode materials and hydrogen–storage alloys, as a general alloy addition, and in the production of some aluminum alloys and steels.
GS alloys
. rare earth alloys
. . **mischmetal**
RT alloying
aluminum alloys
cathodic coatings
cerium
desorption
electrode materials
intermetallics
steels

modified embedded atom method
USE **embedded atom method**

N

nacelle wing configurations
USE **wing nacelle configurations**

nanosatellites
(added October 1998)
DEF Satellites with a total mass smaller than 10 kg incorporating miniaturized electronic and mechanical systems.
UF *nanosats*
GS artificial satellites
. **nanosatellites**
RT microelectromechanical systems
microminiaturization
microminiaturized electronic devices
microsatellites
satellite constellations
satellite design
small satellite technology
small scientific satellites

nanosats
USE **nanosatellites**

Nozomi Mars Orbiter
(added August 1998)
DEF A Japanese Mars mission spacecraft designed to study the Martian upper atmosphere and its interaction with the solar wind, and to develop technologies for use in future planetary missions. Specifically, instruments on the spacecraft enable the measurement of the structure, composition and dynamics of the ionosphere; aeronomy effects of the solar wind; the escape of atmospheric constituents; the intrinsic magnetic field; and dust in the upper atmosphere and in–orbit around Mars.
UF *Planet–B spacecraft*
GS interplanetary spacecraft
. Mars probes
. . **Nozomi Mars Orbiter**
Japanese spacecraft
. **Nozomi Mars Orbiter**
unmanned spacecraft
. space probes
. . Mars probes
. . . **Nozomi Mars Orbiter**
RT aeronomy
Deimos
Phobos
planetary atmospheres
solar planetary interactions

O

optical interconnects
(added June 1998)
GS **optical interconnects**
. free–space optical interconnects
RT connectors
electric connectors
integrated optics
optical computers
optical switching
optoelectronic devices
photonics

orbit determination
(added December 1998)
GS **orbit determination**
. airborne range and orbit determination
. orbit calculation
. . minimum variance orbit determination
. . orbital position estimation
RT Global Positioning System
position errors
satellite tracking
space navigation
spacecraft control
spacecraft position indicators

P

PDS (spectroscopy)
USE **photothermal deflection spectroscopy**

perfectly matched layers
(added July 1998)
DEF In the area of computational electromagnetism, an absorbing boundary condition used for terminating infinite domain calculations in the finite–difference time–domain (FDTD) or finite element methods. The approach has also been extended to the analysis of some problems in acoustics.
UF *PML (electromagnetism)*
GS conditions
. boundary conditions
. . **perfectly matched layers**
RT computational electromagnetics
computational grids
electromagnetic absorption
electromagnetic scattering
finite difference theory
finite element method
Maxwell equation

Phaethon (hypothetical planet)
USE **hypothetical planets**

Phobos spacecraft
(added August 1998)
DEF Two Soviet spacecraft (Phobos 1 and 2, both launched in July 1988) designed to study the plasma environment in the Martian vicinity, the surface and atmosphere of Mars, and the surface composition of the Martian satellite Phobos. Other mission objectives included the study of the interplanetary environment and solar observations.
GS interplanetary spacecraft
. Mars probes
. . **Phobos spacecraft**
Soviet spacecraft
. **Phobos spacecraft**
unmanned spacecraft
. space probes
. . Mars probes

. . . **Phobos spacecraft**
RT Mars atmosphere
Mars environment
Phobos

photothermal deflection spectroscopy
(added November 1998)
UF *PDS (spectroscopy)*
GS spectroscopy
. **photothermal deflection spectroscopy**
RT optical measurement
photoacoustic spectroscopy
thermal diffusivity
thermal lensing

planet X
USE **hypothetical planets**

Planet–B spacecraft
USE **Nozomi Mars Orbiter**

PML (electromagnetism)
USE **perfectly matched layers**

polyvinylidene
USE **vinylidene**

proportional navigation
(added July 1998)
GS navigation
. **proportional navigation**
RT homing
interception
line of sight
missile control
proportional control
rendezvous guidance
terminal guidance

pursuit–evasion games
(added October 1998)
GS games
. **pursuit–evasion games**
RT differential games
evasive actions
interception
optimal control
pursuit tracking
trajectory optimization
zero sum games

R

Reissner–Mindlin plates
USE **Mindlin plates**

renewable energy
(added December 1998)
GS **renewable energy**
. geothermal energy utilization
. hydroelectricity
. tidepower
. waterwave energy
. windpower utilization
RT bioconversion
biomass energy production
clean energy
energy policy
∞ energy sources
energy technology
geothermal energy conversion
hydrogen–based energy
ocean thermal energy conversion
solar energy conversion
waste utilization
waterwave energy conversion

Ringleb flow
(added July 1998)
GS fluid flow
. compressible flow
. . **Ringleb flow**
. steady flow
. . **Ringleb flow**
. two dimensional flow
. . **Ringleb flow**
RT critical flow
subsonic flow
transonic flow

S

scarf joints
(added March 1998)
DEF A joint in which the overlapping parts are tapered to form a continuous length, with no increase in dimension at the joint.
GS joints (junctions)
. **scarf joints**
RT bolted joints
bonded joints
lap joints
metal joints
scarfing

scene generation
(added July 1998)
GS imaging techniques
. **scene generation**
simulation
. **scene generation**
RT computer graphics
flight simulation
image reconstruction
scientific visualization
target simulators

screech tones
(added March 1998)
DEF Discrete acoustic tones produced by imperfectly expanded supersonic jets. The phenomenon is a result of a resonant feedback condition involving downstream traveling shear–layer disturbances and upstream traveling acoustic waves.
GS elastic waves
. sound waves
. . noise (sound)
. . . aerodynamic noise
. . . . **screech tones**
frequencies
. acoustic frequencies
. . **screech tones**
RT aeroacoustics
feedback
jet aircraft noise
jet mixing flow
nozzle flow
shear layers
supersonic jet flow
supersonic nozzles

seaborgium
(added May 1998)
GS chemical elements
. **seaborgium**
RT bohrium
dubnium

Sea–viewing Wide Field–of–view Sensor
(added December 1998)
UF *SeaWiFS*
GS scanners
. ocean color scanner
. . **Sea–viewing Wide Field–of–view Sensor**
RT chlorophylls
Coastal Zone Color Scanner
ocean surface
phytoplankton
remote sensors
satellite–borne instruments
water color

SeaWiFS
USE **Sea–viewing Wide Field–of–view Sensor**

Shergotty Nakhla Chassigny meteorites
USE **SNC meteorites**

Shuttle Superlightweight Tank
USE **external tanks**
propellant tanks

SLWT (propellant tank)
USE **external tanks**
propellant tanks

smart materials
(added March 1998)
DEF Engineered materials capable of responding to their environment to a significant degree, by virtue of intrinsic properties and/or built–in sensor/actuator elements. Applications of these materials include vibration suppression/isolation, precision positioning, damage detection, and tunable devices.
UF *intelligent materials*
RT actuators
composite materials
electrorheological fluids
electrostriction
ferroelastic materials
ferroelasticity
ferroelectric materials
ferromagnetic materials
∞ materials
piezoelectric ceramics
∞ sensors
shape memory alloys
smart structures
vibration damping

SNC meteorites
(added March 1998)
DEF Meteorites with petrologic characteristics, isotopic signatures, trapped gas compositions, and relatively young crystallization ages (less than 1.3 billion years), which together point to a Martian origin. The name of these meteorites is derived from first three known examples—Shergotty, Nakhla, and Chassigny.
UF *Martian meteorites*
Shergotty Nakhla Chassigny meteorites
GS celestial bodies
. meteorites
. . stony meteorites
. . . achondrites
. . . . **SNC meteorites**
RT chassignites
Mars (planet)
Mars surface
nakhlites
shergottites

sonochemistry
USE **ultrasonic processing**

space station modules
(added November 1998)
GS modules
. **space station modules**

. . Kvant modules
. . Priroda module
. . Unity connecting module
. . Zarya control module
RT air locks
compartments
International Space Station
Mir space station
orbital assembly
space erectable structures
space station structures
spacecraft modules

superhumps (astronomy)
(added October 1998)
RT accretion disks
astronomical photometry
binary stars
cataclysmic variables
dwarf novae
eclipsing binary stars
stellar spectrophotometry

T

thermal lenses
USE **thermal lensing**

thermal lensing
(added November 1998)
UF *thermal lenses*
GS **thermal lensing**
. thermal blooming
RT atmospheric optics
focusing
laser beams
photothermal deflection spectroscopy
wave front deformation

time synchronization
(added December 1998)
GS synchronism
. **time synchronization**
RT clocks
frequency standards
frequency synchronization
Global Positioning System
time measurement
time signals
universal time

Titan 4B launch vehicle
(added October 1998)
GS launch vehicles
. Titan launch vehicles
. . Titan 4 launch vehicle
. . . **Titan 4B launch vehicle**
rocket vehicles
. multistage rocket vehicles
. . Titan launch vehicles
. . . Titan 4 launch vehicle
. . . . **Titan 4B launch vehicle**
RT Cassini mission
laser gyroscopes

TRACE satellite
USE **Transition Region and Coronal Explorer**

Transition Region and Coronal Explorer
(added May 1998)
DEF Small Explorer Mission satellite supporting the investigation of the relationships between fine–scale magnetic fields and their associated plasma structures in the transition region and lower corona of the Sun.
UF *TRACE satellite*
GS artificial satellites
. scientific satellites
. . Explorer satellites
. . . **Transition Region and Coronal Explorer**
RT chromosphere
SOHO Mission
solar atmosphere
solar corona
solar magnetic field
solar observatories
solar physics
solar transition region

transplutonic planets
USE **hypothetical planets**

Trefftz method
(added July 1998)
DEF Boundary–type approximation scheme for the solution of boundary value problems for partial differential equations.
UF *hybrid–Trefftz finite element method*
GS analysis (mathematics)
. numerical analysis
. . approximation
. . . boundary element method
. . . . **Trefftz method**
RT bending theory
boundary conditions
boundary value problems
finite element method
partial differential equations
plate theory
structural analysis

TRMM satellite
(added May 1998)
DEF Satellite supporting the joint US–Japanese Tropical Rainfall Measuring Mission (TRMM) to explore tropical rainfall and its effects on the Earth energy budget, general circulation, and climate. The TRMM satellite represents the first dual deployment of a precipitation radar and passive microwave radiometer on an Earth–viewing satellite.
UF *Tropical Rainfall Measuring Mission sat*
GS artificial satellites
. meteorological satellites
. . **TRMM satellite**
. scientific satellites
. . **TRMM satellite**
RT atmospheric circulation
Earth radiation budget
equatorial atmosphere
rain
tropical meteorology

Tropical Rainfall Measuring Mission sat
USE **TRMM satellite**

U

ultrasonic processing
(added June 1998)
DEF The use of ultrasonic radiation to synthesize a compound or material, or alter the structure, properties, or form of a material.
UF *sonochemistry*
ultrasonic treatment
RT∞ processing
ultrasonic cleaning
ultrasonics

ultrasonic treatment
USE **ultrasonic processing**

Unity connecting module
(added November 1998)
DEF Component of the International Space Station providing six ports that serve as connecting points for other station modules and framework elements.
GS modules
. space station modules
. . **Unity connecting module**
RT International Space Station
spacecraft docking

V

very large transport aircraft
(added November 1998)
DEF Aircraft capable of a maximum takeoff weight greater than 400 metric tons (881,600 lbs) or having a seating capacity greater than 660.
UF *VLTA (aircraft)*
GS transport aircraft
. **very large transport aircraft**
RT cargo aircraft
passenger aircraft

VLTA (aircraft)
USE **very large transport aircraft**

W

water sampling
(added March 1998)
DEF The process of obtaining a representative sample of water from any natural or artificial environment.
GS sampling
. **water sampling**
RT environmental monitoring
ground water
pollution monitoring
sea water
surface water
water
water pollution
water quality

wave rotors
(added March 1998)
DEF Rotor devices that use gasdynamic waves to transfer energy rather than the motion of solid surfaces. Typically, they consist of a series of passages arranged on a drum which rotates about an axis. Through rotation, the ends of the passages are periodically exposed to various circumferentially arranged ports which initiate the traveling expansion or compression waves within the passages. The particular circumferential location of the ports determines the thermodynamic cycle of the working fluid.
GS rotating bodies
. rotors
. . **wave rotors**
RT compression waves
energy transfer
engine parts
gas dynamics
gas generators
gas turbine engines
topping cycle engines
turbomachinery
turboshafts
wave generation

wing–body and tail configurations
USE **body–wing and tail configurations**

wing–body configurations
USE **body–wing configurations**

X

X–32 aircraft
(added October 1998)
DEF Experimental supersonic strike fighter developed to be configured as a conventional or short takeoff/vertical landing vehicle. Developed as part of the Joint Strike Fighter (JSF) program.
GS Boeing aircraft
. **X–32 aircraft**
jet aircraft
. **X–32 aircraft**
research vehicles
. research aircraft
. . **X–32 aircraft**
supersonic aircraft
. **X–32 aircraft**
V/STOL aircraft
. **X–32 aircraft**

X–35 aircraft
(added October 1998)
DEF Experimental strike fighter incorporating a vertical lift fan for short takeoff/vertical landing capability. Developed as part of the Joint Strike Fighter (JSF) program.
GS jet aircraft
. **X–35 aircraft**
Lockheed aircraft
. **X–35 aircraft**
research vehicles
. research aircraft
. . **X–35 aircraft**
V/STOL aircraft
. **X–35 aircraft**

Z

Zarya control module
(added November 1998)
DEF Component of the International Space Station providing propulsion, steering, and communications during the early assembly stages of the station; later serving as a docking port and fuel tank. Zarya was built by Russia under contract to the U.S. and is owned by the U.S.
GS modules
. space station modules
. . **Zarya control module**
RT International Space Station

zero sum games
(added October 1998)
GS games
. **zero sum games**
RT differential games
Markov processes
optimal control
pursuit–evasion games
saddle points (game theory)

NASA THESAURUS SUPPLEMENT

PART 2
ROTATED TERM DISPLAY

NUMERALS

Deep Space **1** Mission
H- **2** control
Delta **3** launch vehicle
Delta **4** launch vehicle
Titan **4B** launch vehicle
X- **32** aircraft
X- **35** aircraft
Boeing **717** aircraft

A

Darkstar unmanned **aerial** vehicle
use pilotless aircraft reconnaissance aircraft
Boeing 717 **aircraft**
very large transport **aircraft**
VLTA **(aircraft)**
use very large transport aircraft
X-32 **aircraft**
X-35 **aircraft**
Alpha Magnetic Spectrometer
AMS (spectrometer)
use Alpha Magnetic Spectrometer
antenna gain
antiphase boundaries
antiphase domains
use antiphase boundaries
APB (materials)
use antiphase boundaries
superhumps **(astronomy)**
embedded **atom** method
modified embedded **atom** method
use embedded atom method

B

Planet- **B** spacecraft
use Nozomi Mars Orbiter
kink **bands**
Euler-Bernoulli **beam** theory
use Euler-Bernoulli beams
Euler-Bernoulli **beams**
Euler- **Bernoulli** beam theory
use Euler-Bernoulli beams
Euler- **Bernoulli** beams
Biot–Savart law
wing- **body** and tail configurations
use body-wing and tail configurations
wing- **body** configurations
use body-wing configurations
Boeing 717 aircraft
bohrium
Hale- **Bopp** comet
antiphase **boundaries**

C

digital **cameras**
cascode devices
Shergotty Nakhla **Chassigny** meteorites
use SNC meteorites
EAM (physical **chemistry)**
use embedded atom method
MEAM (physical **chemistry)**
use embedded atom method
clamped structures
Hale-Bopp **comet**
free-space optical **communication**
enantiomeric **compounds**
use enantiomers
nacelle wing **configurations**
use wing nacelle configurations
wing-body **configurations**
use body-wing configurations
wing-body and tail **configurations**
use body-wing and tail configurations
Unity **connecting** module
H-2 **control**
Zarya **control** module
Transition Region and **Coronal** Explorer
corrugated waveguides
cycloaddition
Darkstar unmanned aerial vehicle
use pilotless aircraft reconnaissance aircraft

D

Deep Space 1 Mission
photothermal **deflection** spectroscopy
deformable mirrors
Delta 3 launch vehicle
Delta 4 launch vehicle
orbit **determination**
cascode **devices**
MEMS (electromechanical **devices)**
use microelectromechanical systems
dielectric waveguides
differential games
digital cameras
antiphase **domains**
use antiphase boundaries
DS1 (space mission)
use Deep Space 1 Mission
dubnium

E

EAM (physical chemistry)
use embedded atom method
PML **(electromagnetism)**
use perfectly matched layers
MEMS **(electromechanical** devices)
use microelectromechanical systems

F

G

H

I

J

K

L

M

N

O

P

R

S

T

U

V

W

X

Z

NASA THESAURUS SUPPLEMENT

PART 3
CHANGES

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The NASA Thesaurus Supplement is a cumulative update to the 1998 edition of the NASA Thesaurus (NASA/SP-1998-7501). The Supplement, published every 6 months, includes all new terms and associated hierarchies added since the cutoff for the 1998 edition (December 1997). Parts 1 and 2 (Hierarchical Listing and Rotated Term Display) correspond to Volumes 1 and 2 of the 1998 printed edition of the NASA Thesaurus. Definitions are included in Part 1; uppercase/lowercase forms are provided in both Parts 1 and 2. Part 3 is a list of deletions or changes to valid terms.

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